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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/282,772

03/31/1999

SEIJI TANUMA

0941.63006

9077

24978

7590

03/11/2002

GREER, BURNS & CRAIN
300 S WACKER DR
25TH FLOOR
CHICAGO, IL 60606

EXAMINER

QI, ZHI QIANG

ART UNIT

PAPER NUMBER

2871

DATE MAILED: 03/11/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/282,772	TANUMA ET AL.	
	Examiner	Art Unit	
	Mike Qi	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 4-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 4-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Claim Rejections - 35 U.S.C. § 103

1. The following is a quotation of 35 U.S.C. 103 (a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 1 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Applicant admitted prior art in view of US 6,201,588 (Walton et al) and US 5,907,380 (Lien).

Claim 1, Applicant admitted prior art discloses (the “background of the invention” in the specification, especially col.2, line 19 - col.3, line 32 and Figs. 2A and 2B) that the conventional liquid crystal display device comprising:

- a first substrate (10);
- a second substrate (12),
- a liquid crystal layer (14) interposed between the first and second substrates (10 and 12);
- a group of electrodes such as a pair of electrodes (11a and 11b) disposed on the first substrate (10) (In-plane mode) so as to create an electric field in the liquid crystal layer general parallel to the first substrate in an activated state in which a drive voltage is applied to the pair of electrodes;

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- when the drive voltage is not applied to the electrodes (11a and 11b) (in a non-active state), the liquid crystal molecules (16) are aligned generally perpendicular to the plane of the first substrate(10),
- when the drive voltage is applied to the electrodes (11a and 11b) (in a active state), the liquid crystal molecules are aligned generally parallel to the plane of the first substrate, i.e., aligned in the direction of the electric field inside the liquid crystal layer in the activated state (see the Fig. 2B for the symmetrical middle area).

Applicant admitted prior art does not expressly disclose that the liquid crystal molecules having a pre-tilt angle of less than 90°, and a first projection provided on the first electrode and a second projection provided on the second electrode inducing pre-tilt angle.

However, Walton discloses (col.1, lines 19-21; col.7, lines 38-44) that it is very well known to provide a rubbed alignment layer to control the alignment and the pretilt angle of adjacent liquid crystal molecules in a liquid crystal layer, and it is preferable in the homeotropic liquid crystal cells that the pretilt angle of liquid crystal molecules be in the range from equal to or greater than 80° to less than 90°, so that to obtain a high display quality.

Lien discloses (col.5, lines 56-62; Figs.5 and 6) that the electrode wall (62) produce a lateral electric field that combines with the lateral electric field from the edges of the pixel electrode (26) defining the LC cell to cause the LC molecules to tilt in a desired direction when a voltage is applied across the pixel, and the electrode wall (62) is formed on the first substrate (22) and is formed on the second substrate (24). Therefore, the principle of the electrode wall

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(62) is the same as the first projection is formed on the first electrode (e.g., pixel electrode) and the second projection is formed on the second electrode (e.g., common electrode), and the common electrode (second electrode) must be separated with the pixel electrode (first electrode) and the separation space is a part of the pixel, so as to control the LC molecules tilt angle in a desired direction. Lien also indicates (col.5, lines 59-62) that by providing such tilt control, conventional rubbing steps associated with alignment layers can be avoided.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to have a pre-tilt angle of less than 90° and a first projection provided in the first electrode and second projection provided on the second electrode as claimed in claim 1 for achieving a high display quality and controlling the tilt angle in a desired direction so avoiding such conventional rubbing steps.

3. Claim 4 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Applicant admitted prior art in view of US 6,180,026 (Rieger et al).

Claim 4, Applicant admitted prior art discloses (the “background of the invention” in the specification, especially col.2, line 19 - col.3, line 32 and Figs. 2A and 2B) that the conventional liquid crystal display device comprising:

- a first substrate (10);
- a second substrate (12),
- a liquid crystal layer (14) interposed between the first and second substrates (10 and 12);

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- a group of electrodes such as a pair of electrodes (11a and 11b) disposed on the first substrate (10) (In-plane mode) so as to create an electric field in the liquid crystal layer general parallel to the first substrate in an activated state in which a drive voltage is applied to the pair of electrodes;
- when the drive voltage is not applied to the electrodes (11a and 11b) (in a non-active state), the liquid crystal molecules (16) are aligned generally perpendicular to the plane of the first substrate(10),
- when the drive voltage is applied to the electrodes (11a and 11b) (in a active state), the liquid crystal molecules are aligned generally parallel to the plane of the first substrate, i.e., aligned in the direction of the electric field inside the liquid crystal layer in the activated state (see the Fig. 2B for the symmetrical middle area).

Applicant admitted prior art does not expressly disclose that the liquid crystal layer having a birefringence larger than about 0.1 but smaller than about 0.25.

However, Rieger discloses (col.3, line 27 - col.4, line 29) that a nematic liquid crystal mixture having a birefringence Δn of at least 0.12, and these mixture allow short switching times at reasonable threshold voltages, and the birefringence Δn of the nematic liquid crystal mixture is 0.12 to 0.20, preferred 0.13 to 0.18.

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Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use the liquid crystal layer having a birefringence is 0.10 to .025 as claimed in claim 4 for achieving a short switching times so as to increase the response speed.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant admitted prior art and Rieger as applied to claim 4 above, and further in view of US 5,374,374 (Weber et al).

Claim 5, Weber discloses (col.12, lines 45-51) that a liquid crystal mixtures contain tolan compounds, so as to allow using smaller layer thickness and giving significantly shorter response times.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use a liquid crystal layer contain a tolan-family component as claimed in claim 5 for achieving a shorter response times so as to increase the response speed.

5. Claim 6 is rejected under 35 U.S.C. 103 (a) as being unpatentable over Applicant admitted prior art in view of US 6,201,588 (Walton et al), US 5,907,380 (Lien) and Yoshida et al "Inclined Homeotropic Alignment by Irradiation of Unpolarized UV Light" *jpn. J.Appl. Phys.*, Vol.36 (1997), pp.428-431.

Claim 6, all the limitations are disclosed from the Applicant admitted prior art as the explanation above. Applicant admitted prior art also discloses (col.3, lines 10-13) that a molecular alignment film provided on the surface of the substrate (10) to cover the electrodes (11a and 11b).

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Concerning the liquid crystal molecules having a pre-tilt angle of less than 90° , and a first region in the alignment film in correspondence to the first electrode and a second region in the alignment film in correspondence to the second electrode formed by ultraviolet irradiation inducing pre-tilt angle, that is the same as the first projection and the second projection in the claim 1, and that at least would have been an obvious variation as the explanation of Walton and Lien above, except the regions inducing the pre-tilt angle are formed by ultraviolet irradiation.

However, Yoshida discloses that rubbing the surface of the polyimide film (alignment film) presents the problems of contamination and static electricity (that could damage the switching elements under the alignment film), so that using UV alignment technology without rubbing the surface.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to employ ultraviolet irradiation to form the first region on the first electrode and second region on the second electrode inducing the pre-tilt angle as claimed in claim 6 for preventing the contamination and the static electricity.

Response to Arguments

6. Applicant's arguments filed on Dec.18, 2001 have been fully considered but they are not persuasive.

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Applicant's **only** arguments are as follows:

- 1) The reference Walton does not disclose that the pre-tilting locally provided in correspondence to the first and second electrodes.
- 2) The reference Lien uses a transparent material to form the projection, the invention uses low-resistance metal to form the projection.
- 3) The references do not disclose the pixel area has a separation space between the first and the second electrodes as claimed in the claims.

Examiner's responses to Applicant's **only** arguments are as follows:

1) The reference Walton discloses that it is very well known to provide a rubbed alignment layer to control the alignment and the pretilt angle of adjacent liquid crystal molecules in a liquid crystal layer, and it is preferable in the homeotropic liquid crystal cells that the pretilt angle of liquid crystal molecules be in the range from equal to or greater than 80° to less than 90° , so that to obtain a high display quality. The reference Lien discloses locally form the projection to control the pre-tilting.

2) In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the projections are provided on the electrodes are made of low-resistance metal) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

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3) The electrical voltage is applied between the pixel electrode and the common electrode, so that the common electrode (second electrode) must be separated with the pixel electrode (first electrode), and leave a separation space in the pixel area.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (703)308-6213 .

Mike Qi
March 6, 2002.


William L. Sikes
Supervisory Patent Examiner
Technology Center 2800